1873MNRAS..33..484C

(1) The influence may be imperceptible to ordinary methods of observation ;

(2) Or may be perceptible only as affecting the arcs of vibration in a lesser or greater degree ;

(3) Or may be sufficiently powerful to cause the clocks to move entirely in sympathy.

In the practical use of clocks, cases (1) and (3) will never cause error ; in the one instance no injurious effect would be produced, and in the other the effect would soon be perceived. But not so with case (2). For the variations of arc would usually cause small alternate accelerations and retardations in the time, which, in the daily rating of an ordinary clock, might not be distinguished or separated from other greater sources of error (as was the case with the Transit of *Venus* clocks, after bracing the wooden stand, on which they were temporarily placed for trial, as before mentioned). No doubt, however, if a clock, supposed to be so influenced, were compared very frequently, by some accurate method, with another independent clock (suppose by coincidence of beats, using an intermediate chronometer), the inequality of rate would then be perceived. Such inequalities, even if small in magnitude, being of periodical character, might affect injuriously any delicate experiment, and would be especially mischievous in any clock used for very accurate or fundamental work. Examination of the arc would, however, always reveal the existence of disturbance.

Some apology may be necessary for the length of this paper, but I have thought that, in a matter of experiment of this kind, it was desirable to give an account of the phenomena observed in some detail.

Royal Observatory, Greenwich,
1873, *June* 10.

On a Recording Micrometer. By W. H. M. Christie, Esq.

In observations of zenith distance with a meridian instrument it is of great importance to secure several bisections of a star during its passage across the field, and also to have a permanent record of the corresponding micrometer-readings for correction of the mistakes which no doubt often occur. To secure both of these objects without throwing any more work on the micrometer-screw, or in any way interfering with its action, there seems to me nothing so simple as putting a thin cylinder covered with paper on the micrometer head and making punctures on it ; but some plan must be adopted for distinguishing the punctures corresponding to the several bisections of the same object, and also those corresponding to any particular object from others previously made. I would suggest two arrangements for this, the latter of which is more complete, but at the same time probably rather too complicated for general use.

1873MNRAS..33..484C

TO ILLUSTRATE MR. CHRISTIE'S PAPER ON "A RECORDING MICROMETER".

Fig. 1.

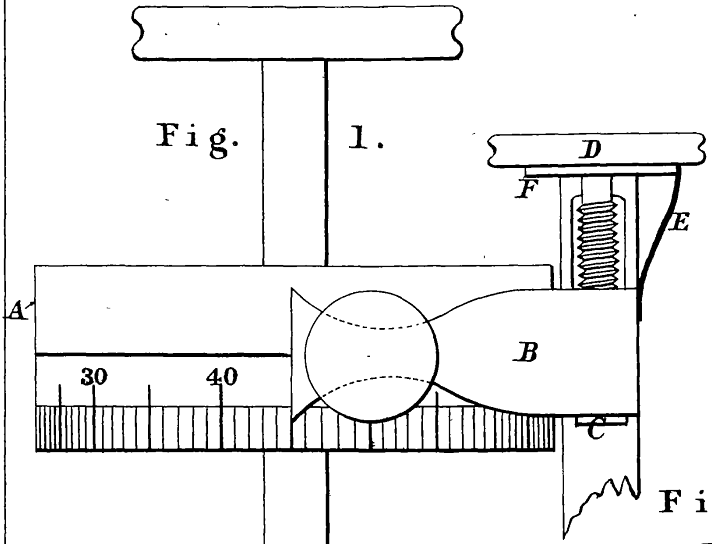


Fig. 3.

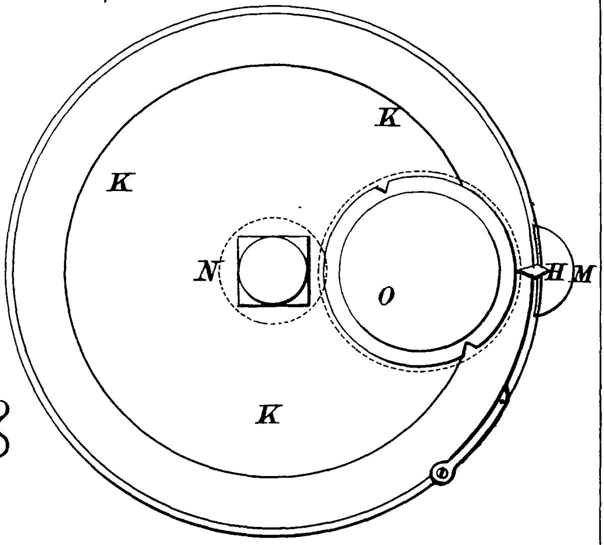
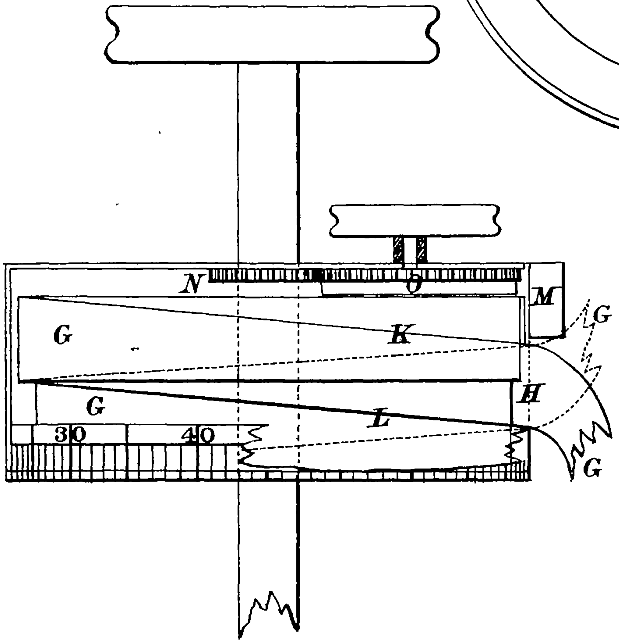


Fig. 2.



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1873MNRAS..33..484C

TO ILLUSTRATE MR. CHRISTIE'S PAPER ON "A RECORDING MICROMETER".

Fig. 1.

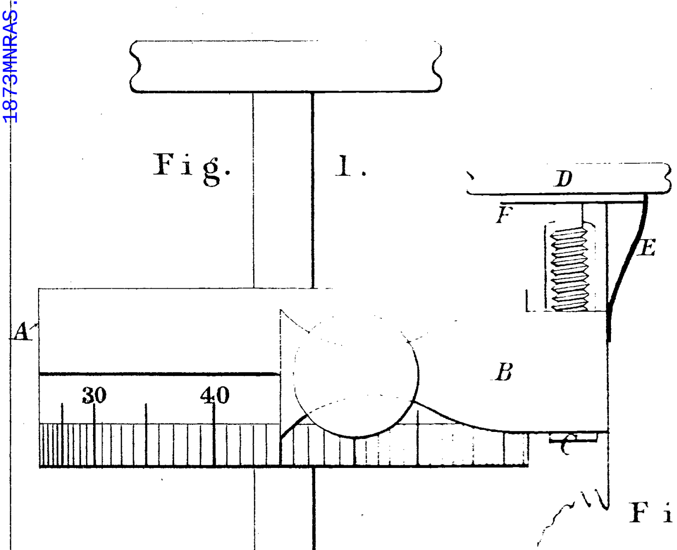


Fig. 3.

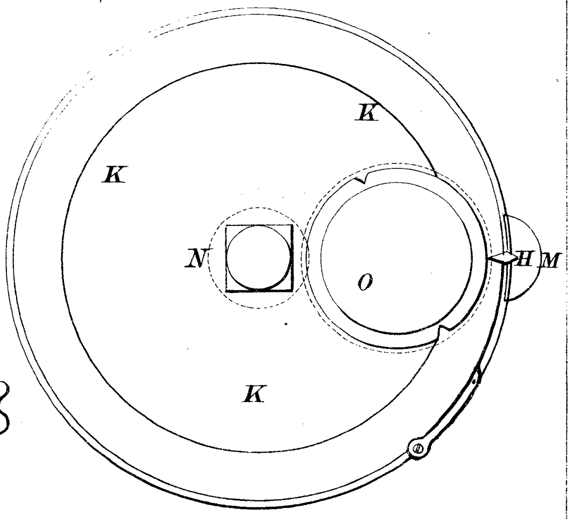
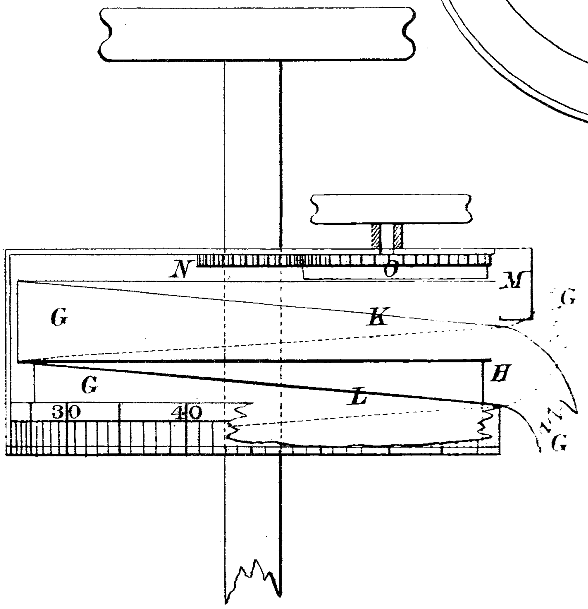


Fig. 2.



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1873MNRAS..33..484C

Figure I is a front view of the simpler plan. A light brass drum, A, covered with cloth, with a fillet of paper fastened round it, is slipped on to the end of the micrometer-screw and held in its place by a catch; two steady pins on the upper surface of the divided head, and at different distances from the centre, will prevent any shift relatively to the head, and ensure the correspondence of the overlapping part of the paper on the drum with the micrometer zero. A puncture is made by pressing a pricker on the spring, B, against the paper after each bisection of a star, whilst a stop prevents any injurious pressure from being applied to the micrometer. To distinguish the several bisections, the spring is fixed in a slide, C, and carried through a definite space before each bisection by turning the screw, D, through a quarter turn; E is a spring pressing against F, and falling into a notch at each quarter turn of the screw D.

When a fresh drum is put on, the zero must be marked by a puncture which ought to be through the overlapping part of the paper, so as to give both 0 and 100 of the scale. After making several bisections of a star, the punctures are to be read off by bringing them up to the straight edge of the spring and reading off the divided head, each being then marked with a pencil to distinguish it from those made in the next observation.

By using a continuous fillet of paper, this reading off for identification may be dispensed with, fresh paper being used for each new object.

Figures 2 and 3 are a vertical section, and a plan of this second arrangement.

The fillet G passes completely round the micrometer-head, both ends being led through a slit, H, and then coiled up inside the head; the part of the fillet outside may be changed by the following arrangement:—Within the head are two barrels, K, L (one above the other), containing watch-springs, winding in opposite directions; the fillet is wound round the upper barrel, K, many times by the action of its spring, being passed through the slit, H, and after going round the outside of the micrometer-head, is brought inside again through the same slit, and attached to the other barrel, L, when it has been wound up; the fillet is thus stretched by the two springs, and held in position between the jaws of the slit (pressed together by a spring, M), which also mark the zero of the micrometer by prickers making punctures through both parts of the fillet.

The method of recording is exactly the same as in the first plan, all the bisections of any one object being recorded on the same paper.

To change the paper, a toothed wheel, N, on the same arbor as the upper barrel, is turned through rather more than one revolution, by giving half a turn to another wheel, O, which at the same time releases the paper from the jaws of the slit by a cam driving a wedge between them; the lower barrel can thus wind up on

1873MNRAS..33..486M

itself, by the action of its spring, all the paper previously outside the head.

If the weight of this arrangement should prove too much for the micrometer-spring, which ought not to be the case, the recording part may be placed on a separate axle parallel to the micrometer screw, which may be made to turn it by means of toothed wheels.

From the pressure of other matters, much delay has occurred in the introduction of these plans, but Mr. Simms has now applied the arrangement first described to the Greenwich Transit Circle, where it is found to answer very well, and the other will probably be made in a short time.

Blackheath, 1873, *June* 12.

Observations of Occultations of Stars by the Moon, 1872 *and* 1873 (*with the deduced Equations between the Errors of the Lunar Elements*); *and of Phenomena of Jupiter's Satellites, in* 1871 *and* 1873: *made at the Radcliffe Observatory, Oxford.*

(*Communicated by the Radcliffe Observer.*)

Occultations.

No.	Day of Observation.	Phenomenon.	Moon's Limb.	Oxford Mean Solar Time. h m s	Observer.
1	1872. Aug. 12	Dis. of λ Libræ	Dark	9 39 37·7	M
2	Sept. 15	„ τ^1 Aquarii	„	11 22 44·0	K
3	„	„ τ^2 Aquarii	„	12 39 42·4	L
4	„	Reap. of τ^2 Aquarii	Bright	13 43 27·2	L
5	„ 24	Dis. of ϵ Geminorum	„	12 22 36·4	K
6	Oct. 11	„ 35 Capricorni	Dark	10 16 48·9	M
7	„ 14	Reap. of 33 Piscium	Bright	6 48 17·3	K
8	Dec. 9	Dis. of *f* Piscium	Dark	7 12 41·3	K
9	„	Reap. of *f* Piscium	Bright	8 2 14·9	K
10	1873. Jan. 22	Dis. of 28 Libræ	„	18 23 50·8	L
11	Apr. 2	„ 118 Tauri S✻	Dark	9 3 17·8	M & K
12	„	„ „ N✻	„	9 3 24·8	M & K
13	May 8	„ γ^1 Virginis	„	13 5 8·5	K
14	„	„ γ^2 Virginis	„	13 5 21·0	K
15	„	Reap. of γ^1 Virginis	Bright	14 5 10·0	K
16	„	„ γ^2 Virginis	„	14 5 21·9	K

Notes.

1872. Aug. 12. The disappearance was instantaneous and the observation good.

Sept. 15. τ^1 Aquarii (disap.); good.